Amendments to the Claims

1.-31. (Canceled)

32. (Currently Amended) A method for adjusting an optical axis in an inspection apparatus that uses a charged particle beam, the method comprising:

providing the inspection apparatus with a charged-particle-beam (CPB) optical system for guiding an observation charged particle beam along the optical axis from an object to a detector, the CPB optical system including a cathode lens and an X-Y stage for holding the object;

providing ~~an observation CPB~~ self-emitting beam source on a surface of the X-Y stage;

generating an observation charged particle beam from the ~~observation CPB~~ self-emitting beam source for obtaining an image of the object at the detector; and

determining a position of the X-Y stage using the observation charged particle beam to adjust the optical axis.

33. (Previously Presented) The method of claim 32, further comprising:

wobbling a voltage of electrical power applied to the cathode lens; and

while moving the X-Y stage and thus the object relative to and across the optical axis, determining the position of the X-Y stage at which the obtained image of the object does not move as the voltage is wobbled.

34. (Previously Presented) The method of claim 32, wherein the CPB optical system further comprises an imaging-optical system and an objective-optical system, wherein the imaging-optical system is situated downstream of the objective-optical system and includes a front imaging lens group.

35. (Previously Presented) The method of claim 34, wherein adjusting the optical axis comprises performing an optical-axis alignment between the cathode lens and the front imaging lens group.

36. (Previously Presented) The method of claim 34, wherein:

the imaging-optical system further comprises a rear imaging lens group; and

adjusting the optical axis further comprises performing an optical-axis alignment between the front imaging lens group and the rear imaging lens group.

37. (Previously Presented) The method of claim 32, further comprising measuring and correcting an aberration of the CPB optical system using an aberration-measurement pattern.

38. (Currently Amended) In an inspection apparatus that includes a charged-particle-beam (CPB) optical system having a cathode lens and including an X-Y stage for holding an object, a method for adjusting an optical axis of the CPB optical system, the method comprising:

guiding a charged particle beam from the object through the optical system along the optical axis to a detector;

from an adjustment CPB source located on a surface of the X-Y stage, generating an adjustment charged particle beam that propagates from the adjustment CPB source to the ~~object~~detector and produces an image of the object at the detector; and

determining a position of the X-Y stage using the adjustment charged particle beam to adjust the optical axis.

39. (Currently Amended) A method for aligning an inspection apparatus, comprising:

using a first optical system, guiding a first energy beam from a specimen to a first detector along a first optical axis;

using a second optical system, guiding a second energy beam from the specimen to a second detector along a second optical axis;

obtaining an image of a pattern to measure a location of the specimen relative to the second optical axis and a distance of the specimen to the second optical axis; ~~and~~

~~using the measured location and distance,~~determining a baseline from the distance between the first and second optical axes; and

using the baseline, aligning an evaluated area of the specimen to the first optical axis to align the specimen with respect to the first optical axis.

40. (Previously Presented) The method of claim 39, wherein the primary optical system comprises an optical system for imaging electrons from the specimen at a detector by using a mapping projection-optical system.

41. (Previously Presented) The method of claim 39, further comprising:

arranging a fiducial plate defining thereon a first mark and a second mark; and

obtaining an image of the first mark by the first detector through the first optical system and obtaining an image of the second mark by the second detector through the second optical system to thereby define a distance between the first and second optical axes with reference to a relative positional relationship between the first mark and the second mark.

42. (Previously Presented) The method of claim 41, wherein the second energy beam is a light beam.

43. (Previously Presented) The method of claim 39, wherein the second optical system comprises a scanning electron microscope.

44. (Previously Presented) The method of claim 43, wherein the second energy beam is an electron beam.

45. (Previously Presented) The method of claim 39, further comprising a stage on which the specimen is mounted, the stage comprising at least one of:

a resolution chart having a line pattern array of lines elongated along a first direction and gradually changing pitch distances along a second direction perpendicular to the first direction; and

a beam-position-measuring pattern having a cross pattern or a pattern of L-shaped features.

46. (Previously Presented) The method of claim 39, wherein the specimen has a surface comprising an evaluated region and a fiducial mark provided at the same height as the evaluated region.

47. (Previously Presented) The method of claim 39, wherein the first optical system includes an optical source comprising a laser diode.

48. (Currently Amended) A charged-particle-beam (CPB) apparatus, comprising:

an irradiation-optical system having a respective optical axis and being situated and configured for guiding a charged particle beam from a beam source to a surface of a specimen on a stage;

a detection-optical system situated and configured for detecting the charged particle beam from the surface and for producing an image of the surface, the detection-optical system and irradiation-optical system being situated in a vacuum environment;

a beam deflector provided in at least one of the irradiation-optical system and ~~imaging-optical~~detection-optical system; and

an off-axis optical system having an optical axis situated at a predetermined distance from the axis of the irradiation-optical system, the off-axis optical system ~~comprising a vacuum seal for passing therethrough~~being configured to illuminate the specimen with an optical alignment beam ~~for aligning~~passing from outside the vacuum environment through a window and through an objective lens situated in the vacuum environment so as to align the specimen with the axis of the irradiation-optical system.

49. (Previously Presented) The CPB apparatus of claim 48, wherein the detection-optical system comprises a detector and a projection-optical system, the projection-optical system being situated and configured for projecting the charged particle beam from the specimen to a detection surface of the detector.

50. (Previously Presented) The CPB apparatus of claim 48, wherein the off-axis optical system comprises an optical microscope situated and configured for viewing the surface of the specimen.

51. (Previously Presented) The CPB apparatus of claim 48, wherein the off-axis optical system comprises a light source provided within an atmosphere.

52. (Previously Presented) The CPB apparatus of claim 51, wherein the off-axis optical system comprises an objective lens including an aperture stop at which an image of the light source is formed for obtaining a Koehler illumination of the surface of the specimen.

53. (Previously Presented) The CPB apparatus of claim 48, wherein the off-axis optical system further comprises a condenser lens and either a half mirror or a beam splitter.

54. (Previously Presented) The CPB apparatus of claim 48, wherein the off-axis optical system forms an image of the specimen surface on a charged-coupled device (CCD).

55. (Previously Presented) The CPB apparatus of claim 54, wherein a signal from the CCD is video-processed to form an image used for performing the alignment.

56. (Previously Presented) The CPB apparatus of claim 48, wherein the beam deflector comprises an E×B configured for transmitting a primary beam and deflecting a trajectory of a secondary beam.

57. (Previously Presented) The CPB apparatus of claim 48, further comprising a first column, a second column, and a specimen chamber.

58. (Previously Presented) The apparatus of claim 48, wherein the optical alignment beam is supplied through an optical fiber and converged by a lens.

59. (Previously Presented) In an apparatus including a specimen stage, a charged-particle-beam (CPB) optical system having a main optical axis, and an off-axis optical system having a respective optical axis, a method for measuring an off-axis distance in the apparatus, the method comprising:

providing a first pattern on the specimen stage;

obtaining a first image of the first pattern using the off-axis optical system;

providing a second pattern at a known distance from the first pattern;

obtaining a second image of the second pattern using the CPB optical system; and

determining a distance between the main optical axis and the optical axis of the off-axis optical system based on the first and second images.

60. (Previously Presented) In an apparatus including a specimen stage, a charged-particle-beam (CPB) optical system having a main optical axis, and an off-axis optical system having a respective optical axis, a method for measuring an off-axis distance in the apparatus, the method comprising:

providing a first pattern on the specimen stage;

obtaining a first image of the first pattern using the off-axis optical system;

using a stage-position-measuring device, measuring a first stage position when obtaining the first image;

using the CPB optical system, obtaining a second image of a pattern on the specimen stage, the pattern being either the first pattern or a second pattern situated a known distance from the first pattern;

using the stage-position-measuring device, measuring a second stage position when obtaining the second image; and

determining a distance between the main optical axis and the optical axis of the off-axis optical system based on the first and second images and the respective first and second stage positions.

61. (Previously Presented) The method of claim 60, wherein the CPB optical system projects an image of a charged particle beam from the specimen to a detection surface.

62. (Previously Presented) The method of claim 60, wherein at least one of the first and second patterns is a fiducial mark provided on the specimen stage.

63. (Previously Presented) The method of claim 60, wherein at least one of the first and second patterns constitutes a portion of a pattern to be evaluated.

64. (Previously Presented) The method of claim 60, wherein the first pattern is a light-visible pattern and the second pattern is a CPB-visible pattern.

65. (Previously Presented) A method for evaluating a specimen with an image obtained using a charged particle beam, the method comprising:

using an off-axis optical system, obtaining an image of a pattern provided on the specimen;

while obtaining the image, measuring a position of a stage holding the specimen;

reading or measuring a stage-position baseline; and

calculating a target stage position from the obtained image, measured stage position, and baseline, and moving the stage toward the target stage position.

66. (Previously Presented) The method of claim 65, wherein:

the image of the pattern is produced using a CPB optical system including a projection-optical system; and

the projection-optical system converges an image, carried by a charged particle beam propagating from the specimen, at a detection surface of a detector.

67. (Previously Presented) The method of claim 65, wherein the off-axis optical system is used as a viewing microscope that produces a magnified image of the pattern.

68. (Previously Presented) In an inspection apparatus including a stage for mounting a specimen for inspection, a charged-particle-beam (CPB) source for generating a charged particle beam from a surface of the specimen, a CPB detector for detecting the charged particle beam, and a deflector situated between the stage and the CPB detector, a method for adjusting an optical axis of the inspection apparatus, the method comprising:

generating a charged particle beam from the CPB source so as to cause the charged particle beam to be generated from the surface of the specimen;

obtaining a first image of the specimen by detecting the charged particle beam while not applying a voltage to the deflector;

obtaining a second image of the specimen by detecting the charged particle beam while applying a voltage to the deflector; and

setting the voltage applied to the deflector based on the first and second images, so as to adjust the optical axis.

69. (Previously Presented) The method of claim 68, wherein the step of generating the charged particle beam from the surface of the specimen comprises using a self-emitting beam source as the specimen.